

CLAIMS

1. A method for carrying out cryogenic air separation comprising:

(A) compressing feed air and passing a first portion of the compressed feed air into a cryogenic air separation plant;

(B) further compressing a second portion of the compressed feed air to produce further compressed feed air, turboexpanding a first part of the further compressed feed air and warming the turboexpanded first part of the further compressed feed air by indirect heat exchange with a second part of the further compressed feed air to condense said second part of the further compressed feed air;

(C) passing the condensed second part of the further compressed feed air into the cryogenic air separation plant; and

(D) producing by cryogenic rectification within the cryogenic air separation plant at least one of product oxygen, product nitrogen and product argon.

2. The method of claim 1 wherein the second part of the further compressed feed air is still further compressed prior to being condensed.

3. The method of claim 2 wherein some of the still further compressed second part is turboexpanded and then warmed to provide further cooling for condensing the second part of the further compressed feed air.

4. The method of claim 1 wherein the first part of the further compressed feed air is cooled prior to being turboexpanded.

5. The method of claim 1 wherein the cryogenic air separation plant comprises a higher pressure column and a lower pressure column, and the condensed second part of the further compressed feed air is passed into the higher pressure column and into the lower pressure column.

6. Apparatus for carrying out cryogenic air separation comprising:

(A) a primary compressor, a booster compressor, a cryogenic air separation plant, means for passing feed air to the primary compressor, means for passing feed air from the primary compressor to the cryogenic air separation plant, and means for passing feed air from the primary compressor to the booster compressor;

(B) a turboexpander, a heat exchanger having a cooling pass and a warming pass, means for passing feed air from the booster compressor to the turboexpander and from the turboexpander to the warming pass, and means for passing feed air from the booster compressor to the cooling pass;

(C) means for passing feed air from the cooling pass to the cryogenic air separation plant; and

(D) means for recovering at least one of product oxygen, product nitrogen and product argon from the cryogenic air separation plant.

7. The apparatus of claim 6 wherein the means for passing feed air from the booster compressor to the cooling pass includes at least one auxiliary compressor.

8. The apparatus of claim 6 further comprising an auxiliary turboexpander, means for passing feed air from the cooling pass to the auxiliary turboexpander, and means for passing feed air from the auxiliary turboexpander to the warming pass.

9. The apparatus of claim 6 further comprising a recycle compressor, and wherein the means for passing feed air from the primary compressor to the booster compressor includes the recycle compressor.

10. The apparatus of claim 6 wherein the cryogenic air separation plant comprises a higher pressure column and a lower pressure column, and wherein the means for passing feed air from the cooling pass to the cryogenic air separation plant communicates with the higher pressure column and with the lower pressure column.